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EDITORIAL – THORACIC ONCOLOGY

Is Radiomics Ready for Prime Time in Managing Non-small Cell Lung Cancer?

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The use of artificial intelligence for positive changes in the various avenues of society remains a controversial topic. However, there is little doubt that it will only enhance the practice of medicine. Radiomic-based machine learning has emerged as an important practice in predicting clinical outcomes in the field of radiology,[1] with increasing applications being tested within the realm of surgical oncology.

In their article "Dual-region computed tomography radiomics-based machine learning predicts subcarinal lymph node metastasis in patients with non-small cell lung cancer" published in this issue of Annals of Surgical Oncology, Hao-Ji Yan et al. demonstrate that the predictive power of a two-region radiomic machine learning model is more accurate than either a single region or a conventional logistic regression model, which utilizes the input of values for typical clinical variables.[2] Their research reinforces the work of other investigators who demonstrated the benefits of this technology in preoperatively predicting lymph node metastases in early T-stage non-small cell lung cancer (NSCLC).[3] However, their study builds upon prior techniques by incorporating the evaluation of the radiomic features at the targeted lymph node with that of the primary tumor to further increase the predictive accuracy, although this was isolated to the subcarinal lymph node station.

The authors aimed to validate such a technique as an alternative, noninvasive strategy to accomplish mediastinal staging in patients with non-small cell lung cancer, which typically necessitates either endoscopic or surgical biopsy. Accurate mediastinal evaluation is critical given its considerable impact on patient's clinical staging and their ultimate treatment strategy. This is especially relevant in the wake of recent publications, such as the CALGB 140503 trial[4] regarding the use of sublobar resections in patients with peripheral early-stage disease, which required pathologically confirmed node-negative status.

While Yan and colleagues successfully demonstrated improved predictive accuracy with their dual-region radiomics-based model for single lymph node status, it has limited overall clinical applicability as it does not provide thorough nodal evaluation. The need for manual image segmentation to define the lymph node region of interest (ROI) also suggests potential constraints on the reproducibility and standardization of such predictive analyses. The development of automated lymph node segmentation to allow for data extraction at multiple node locations is likely essential for the widespread adoption of such technology. Furthermore, while such techniques continue to demonstrate considerable evolution and promise as useful adjuncts to assist with generating individualized predictions regarding lymph node involvement, it does not currently obviate the need to obtain pathologic confirmation.

Given that modern imaging is universally digitalized, the results of this study are not surprising. Since scoring for radiomic-based machine learning is tabulated using objective digital information from a digital image, it seems logical that its predictions should be more precise compared with conventional methods that utilize clinical input that is naturally more subject to human error. The question still remains whether this system will ultimately change multidisciplinary decision-making when treating NSCLC. Passing the scrutiny of the thoracic surgery community can only be accomplished

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by determining its value as a correlative marker in randomized prospective trials with goals of diminishing postoperative morbidity and improving disease-free and overall survival. Radiomic-based machine learning technology will clearly continue to be fine-tuned and utilized for all solid tumors.

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